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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/595,031	12/30/2005	Jens C. Rasmussen	1826.1129	1554

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EXAMINER	
SEDIGHIAN, REZA	

ART UNIT	PAPER NUMBER
2613	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/595,031	RASMUSSEN ET AL.	
	Examiner	Art Unit	
	M. R. Sedighian	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/30/05, 12/11/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Double Patenting

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claims 1, 2, and 3 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 6, 10, 14, and 15 of copending application No. 10/581,853. Although the conflicting claims are not identical, they are not patentably distinct from each other because both application claim a polarization mode dispersion compensator comprising of a polarization transformer to transform polarization of an input optical signal, a compensation unit to compensate for a polarization mode dispersion of the input optical signal and output an output optical signal, a signal quality monitor to measure a state of polarization and a degree of polarization of the output optical signal and generate a feedback signal indicating the measured state of polarization and degree of polarization, and a control circuit to generate based on the feedback signal, control signals for adjusting the polarization transformer in such a

way that a plurality of target states of polarization in which the degree of polarization is measured are realized.

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3, 5-6, and 10-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Ooi (US Patent Application Publication No: 2002/0018266 A1).

Regarding claims 1, 10, and 11, Ooi teaches a polarization mode dispersion compensator (PMD Compensation Apparatus, fig. 1), comprising: a polarization transformer (Polarization Control Section, fig. 1) to transform polarization of an input optical signal (page 6, paragraph 0071); a compensation unit (Variable PMD Compensation Section, fig. 1) to compensate for a polarization mode dispersion of the input optical signal and output an output optical signal (page 6, paragraph 0072); a polarimeter (PMD Monitor, fig. 1) to measure a state of polarization and a degree of polarization of the output optical signal (page 6, paragraph 0079) and generate a feedback signal indicating the measured state of polarization and degree of polarization (page 8, paragraph 0094); and a control circuit (Control Circuit, fig. 1) to generate based on the feedback signal, control signals for adjusting the polarization transformer (Polarization Control Section, fig. 1) in such a way that a plurality of target states of polarization in which the degree of polarization is measured are realized in output optical signals in following operations (page 6, paragraph 0075, page 8, paragraph 0098).

Regarding claim 3, Ooi teaches the compensation optical unit (Variable PMD Compensation Section, fig. 1) is realized in such a way that an amount of differential group delay is introduced by one of a polarization maintaining fiber and a birefringent crystal (page 6, paragraph 0072, lines 9-17 and Optical Delay Device, fig. 1).

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ooi (US Patent Application Publication No: 2002/0018266 A1) in view of Rao et al. (US Patent Application Publication No: 2004/0016874 A1).

Regarding claim 2, Ooi teaches the polarization transformer (10, fig. 1) is realized by multiple rotatable waveplates ($\lambda/4$, $\lambda/2$, fig. 1), wherein control voltages are applied such that a device operation of the polarization transformer corresponds to endless rotatable waveplates (page 6, paragraph 0071). Ooi differs from the claimed invention in that Ooi does not disclose the polarization transformer is realized by multiple three-electrode structures on a $LiNbo_3$ substrate. Rao discloses a polarization transformer (108, fig. 4) that is formed by multiple three-electrode structures on a $LiNbo_3$ substrate (page 2, paragraph 0015, lines 1-7 and page 5, paragraph 0060, lines 1-5). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of invention to incorporate a polarization transformer such as the one of Rao for the polarization transformer of Ooi to provide a polarization transformer that transforms the

fluctuating output polarization state of the optical fiber into a stable state of polarization (Rao, page 1, paragraph 0002).

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ooi (US Patent Application Publication No: 2002/0018266 A1) in view of Taylor (US Patent No: 7,106,979 B1).

Regarding claim 4, Ooi teaches the compensation optical unit (PMD Compensation Apparatus, figs. 1, 7) comprises a plurality of sections of differential group delay introducing elements (21a, 21b, 22, fig. 7). Ooi differs from the claimed invention in that Ooi does not disclose the plurality of sections of differential group delay elements are separated by at least one individually controllable variable retarder with an eigenaxis oriented at an angle of 45 degree. Taylor discloses a polarization mode dispersion compensating apparatus (fig. 3), wherein a differential group delay element (30, fig. 3) is separated by one individually controllable variable retarder with an eigenaxis oriented at an angle of 45 degree (col. 4, lines 62-67, col. 5, lines 1-10). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of invention to incorporate a differential group delay element such as the one of Taylor for the polarization mode dispersion compensation unit of Ooi to further provide continuous control of state of polarization of the transmitted optical signals.

8. Claim 5-7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ooi (US Patent Application Publication No: 2002/0018266 A1) in view of Penninckx et al. (US Patent No: 6,631,221 B2).

Regarding claim 5, Ooi teaches the control circuit generates the control signals for adjusting the polarization transformer in such a way that an optimum state is found from among the target states of polarization (page 6, paragraph 0075, pages 8-9, paragraph 0098). Ooi differs from the claimed invention in that Ooi does not specifically disclose searching for a state with the maximum degree of polarization in a circumference of an actual state in a polarization space. Penninckx discloses a method and device (fig. 1) for compensating PMD of transmitted optical signals (col. 1, lines 5-13), wherein control signals determined by an algorithm are fed back to a polarization controller (3, fig. 1) to compensate for PMD (col. 3, lines 25-32), and wherein optimum states of polarizations can be determined by searching for a state with maximum degree of polarization in circumference of an actual state in a polarization space (col. 4, lines 17-40 and fig. 2). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of invention to incorporate a control algorithm, such as the one of Penninckx, for the control algorithm in the control circuit of Ooi to compensate for imperfections of the polarization elements (Penninckx, col. 3, lines 33-35).

Regarding claim 6, Ooi teaches the control circuit (Control Circuit, fig. 1) records the measured state of polarization and degree of polarization (page 6, paragraph 0075, lines 1-4, page 7, paragraph 0087, lines 14-19). Ooi differs from the claimed invention in that Ooi does not specifically disclose calculating from polarization changes control signals for adjusting the polarization transformer in such a way that the target states of polarization are equally separated from each other and equally distant from the actual state in the polarization space. Penninckx teaches calculating from polarization changes control signals for adjusting a polarization transformer such that target states of polarization are equally separated from each other in equal

distant from an actual state in a polarization space (col. 4, lines 33-45 and 20, A, A', A", B, B', B", fig. 2). It would have been obvious to a person of ordinary skill in the art at the time of invention to incorporate a control algorithm such as the one of Penninckx, for the control algorithm in the controller circuit of Ooi to control the state of polarizations provided by polarization controllers such that different states of polarization can be provided to further compensate polarization mode dispersion of the transmission system.

Regarding claim 7, Penninckx teaches the target states of polarization are preset and located on a circle around an actual state at a predefined distance in a polarization space (col. 4, lines 17-40 and 20, A, A', A", B, B', B", fig. 2).

Regarding claim 9, Ooi teaches the control circuit recognizes changing device characteristics of the polarization transformer in a case where a part of the target states of polarization are not realized (page 6, paragraph 0075, lines 1-4), and takes counter measures such that the polarization transformer (10, fig. 1) operates like endless rotatable waveplates (page 6, paragraph 0071, lines 5-13 and paragraph 0075, lines 6-8). Ooi differs from the claimed invention in that Ooi does not disclose recalculating a voltage which describes the device characteristics of the polarization transformer and generating a control signal for applying the calculated voltage to the polarization transformer. Penninckx teaches a control circuit (8, fig. 1) that controls a polarization transformer (3, fig. 1), wherein when target states of polarization are not realized (col. 2, lines 18-20, 24-35), controller takes counter measures such as recalculating a voltage which describes device characteristics of polarization transformer (col. 4, lines 58-67) and generating a control signal for applying the calculated voltage to the polarization transformer (col. 5, lines 1-5, 11-14). Therefore, it would have been obvious to a person of ordinary skill in

the art at the time of invention to incorporate a control algorithm that recalculates voltages, such as the one of Penninckx, for the control algorithm in the controller circuit of Ooi such that an effective control of polarization transformer can be provided.

9. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ooi (US Patent Application Publication No: 2002/0018266 A1) in view of Penninckx et al. (US Patent No: 6,631,221 B2) and in further view of Price (US Patent Application Publication No: 2004/0208614 A1).

Regarding claim 8, Ooi teaches the control circuit (Control Circuit, fig. 1) records the measured state of polarization and degree of polarization and calculates from polarization changes control signals for adjusting the polarization transformer (page 6, paragraph 0075, pages 8-9, paragraph 0098). Penninckx discloses adjusting (8, fig. 1) a polarization transformer (3, fig. 1) in such a way that the target states of polarization are equally separated from each other and equally distant from the actual state in the polarization space and weights measured degrees of polarization in the target states of polarization by using a distance between each target state of polarization and the actual state in the polarization space (col. 4, lines 33-45 and 20, A, A', A", B, B', B", fig. 2). The modified optical signal transmission system of Ooi and Penninckx differs from the claimed invention in that Ooi and Penninckx do not specifically disclose target states of polarization are unequally separated from each other and unequally distant from the actual state in the polarization space. However, it would have been obvious to control the state of polarization of optical signals such that unequal spacing can be provided between polarization orientations. For example, Price teaches states of polarization of optical signals can be unequally

separated from each other and can be of unequal distant from the actual state in the polarization (page 6, paragraph 0069, lines 18-25). As it is taught by Price, it would have been obvious to a person of ordinary skill in the art at the time of invention that control circuits such as the ones of Ooi or Penninckx that each controls the state of polarizations provided by polarization controllers, can provide unequal state of polarizations for the optical signals transmitted through polarization controller such that different states of polarization can be provided to further compensate polarization mode dispersion in the optical transmission system.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. R. Sedighian whose telephone number is (571) 272-3034. The examiner can normally be reached on 9 to 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. R. Sedighian/
Primary Examiner, Art Unit 2613